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Assessing CP - 42 Habitat Value for Bees using the Floral Resource Index

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Background

- Prairies once dominated 85% of Iowa but that large portion has been reduced drastically to 0.01%. Agriculture expansion is largely to blame for the shocking percent change. [1]
- The Conservation Reserve Program (CRP), administered by the US Department of Agriculture's Farm Service Agency, aims to conserve land, improve water quality, create wildlife habitat, and prevent soil erosion. In 2011, the CP-42 program was launched specifically as a Pollinator Habitat Initiative for forbs and grasses to be planted to increase pollinator habitat. The goals of the CP-42 plantings are for at least nine wildflower species to be found in the seed mix with a minimum of three species blooming in three different periods: April-June 15 , June 15-July, and August-October. However, no official methods exist to assess CP-42 site quality. [2]
- Habitat loss is one of the main contributors to the massive decline in the native bee population and its biodiversity. Loss of land decreases the available floral resources that bees utilize for pollen and nectar, which is their main food supply. Native pollinators are essential to the ecosystem and play a large role in the pollination of about 35% of world crops. [3]

Research Questions

- How do floral resources from 2017 compare to those from 2018 and 2019? Is CP - 42 quality decreasing, increasing, or remaining stagnant?
- Is there a correlation between the density of native bees and floral resources?

Methods

- 36 sites were surveyed in 2017, 2018, and 2019 for this research

Plant Density Sampling:

- Five 100 m transects were randomly established
- 0.5 m by 2.0 m quadrats were placed at 7 m intervals along the transect
- All plants taller than 20 cm were identified and counted within each quadrat

Floral Resource and Bee Pollinator Sampling:

- Four 50 m transects were established within each site and twenty-five 1.0 m by 1.0 m quadrats were placed along the transect
- All live flowers were identified, counted, and recorded
- Four random 2500 m^2 plots were established to collect bees by sweep netting

Calculating Floral Resource Index (FRI) Score:

- Sites were evaluated on a one hundred point scale based on the following:

(A) CP – 42 bloom period goals [4-6]
(B) Floral diversity
(C) Early bloom period density
(D) Middle bloom period density
(E) Late bloom period density

Table 1: Site density scores

Score	Sum of Plant Densities plants/m^2	Score	Sum of Plant Densities plants/m^2
1	0.100 - 3.999	6	20.000 - 23.999
2	4.000 - 7.999	7	24.000 - 27.999
3	8.000 - 11.999	8	28.000 - 31.999
4	12.000 - 15.999	9	32.000 - 35.999
5	16.000 - 19.999	10	> 36.000

$$FRI = \left(\frac{A}{9} \times 40\right) + \left(\frac{B}{20} \times 10\right) + \left(\frac{C+D+E}{30} \times 50\right)$$

Results

Fig.1: Box and Whisker Plot Comparing 2017, 2018, and 2019 FRI Scores

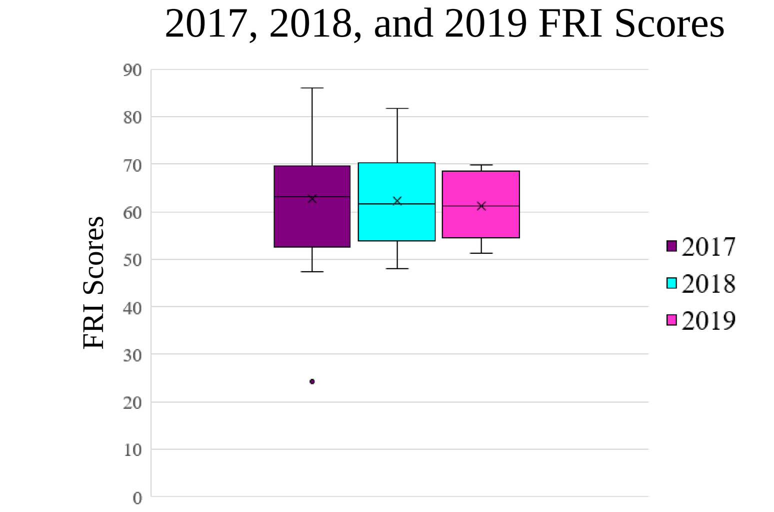


Fig. 2: 2017, 2018, and 2019 FRI Scores

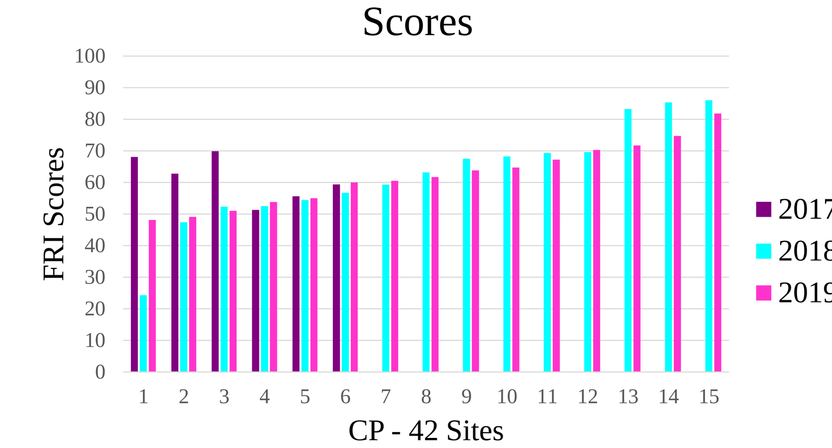


Fig. 3: No Correlation between July Bee Abundance and Site FRI Score

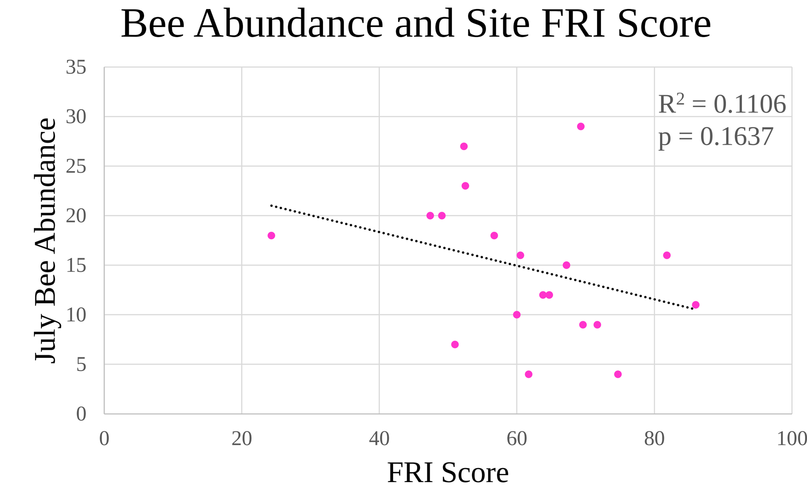


Fig. 4: No Correlation between FRI Score and 2018 Bee Richness

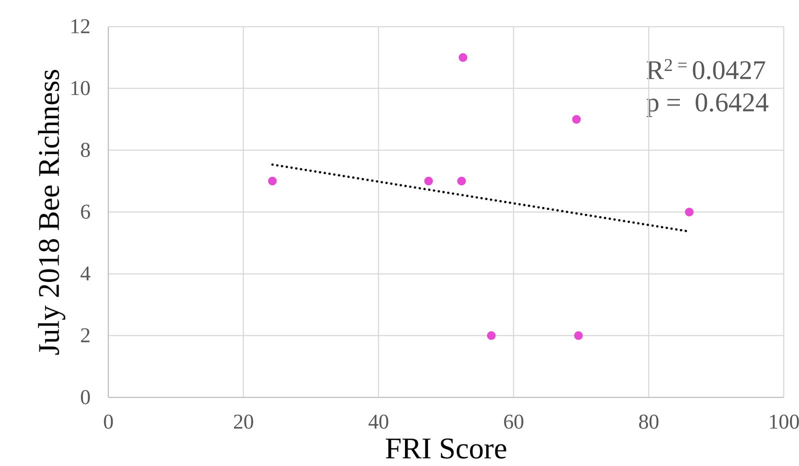


Fig. 5: Density and Blooming Periods for the Site with the Lowest FRI Score

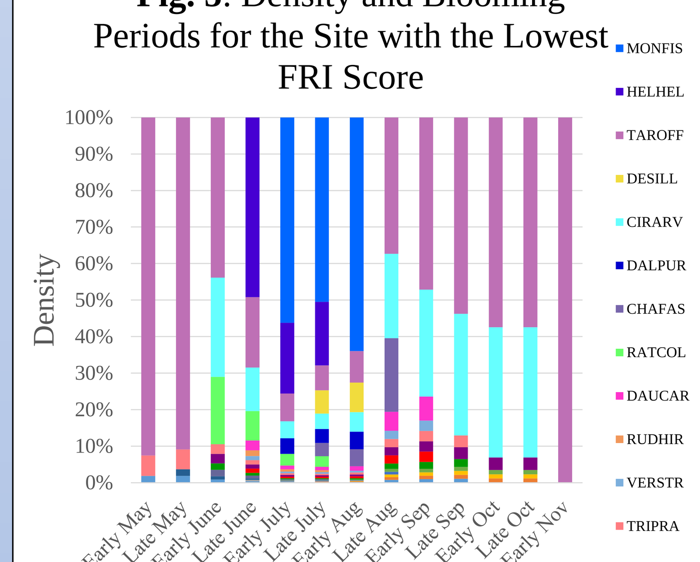


Fig. 6: Density and Blooming Periods for the Site with the Highest FRI Score

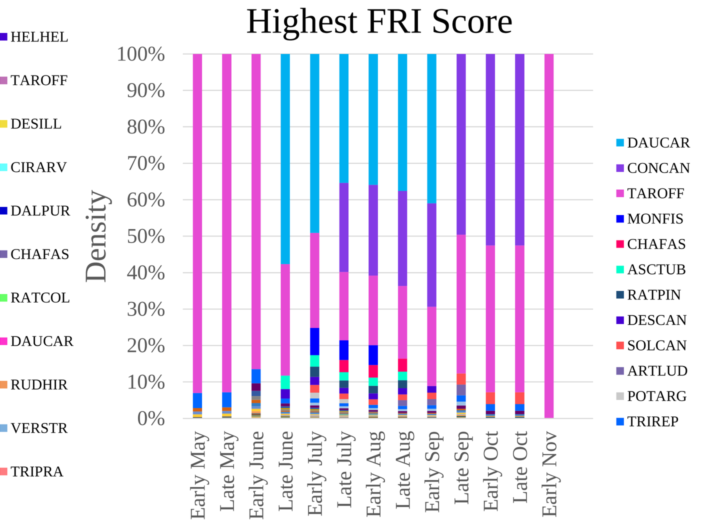
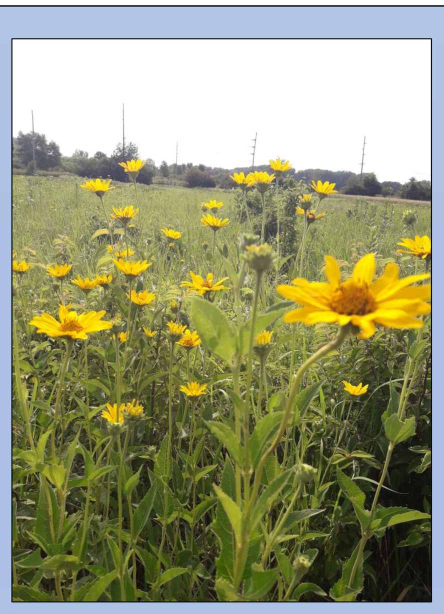
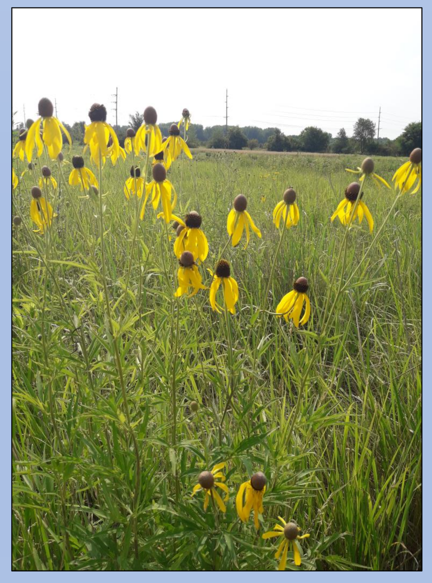


Table 2: Total Number of Bees Captured in 2018-2019

Month	Bee Abundance
Jun-18	109
Jul-18	155
Jun-19	74
Jul-19	125



Acknowledgements

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Conclusions

- No significant differences were found between 2017, 2018, and 2019 FRI scores (Figure 1 and 2).
- FRI scores averaged ~62 per site from the three years. Therefore, the three CP-42 years show consistency pertaining to their FRI scores.
- Sites with higher FRI scores consisted of more floral species (Figure 5 and 6).
- My data suggests that a site with a low FRI score can still provide high quality habitat for pollinators, and conversely, sites with high FRI scores do not necessarily guarantee higher bee diversity or density (Figure 3 and 4).

Fig. 7: Quadrat

Fig. 8: Transect

Fig. 9: 2019 SURP Crew

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Future Direction

- Future research could focus on surveying other beneficial insects besides wild bees.
- Further research is needed to assess the effect of floral diversity, density, and flower shape on the bee community.
- Establishment rates and length of blooming for floral resources within the CRP sites could be evaluated and influence the creation of the next CRP seed mix.

Fig. 10: Agapostemon texanus

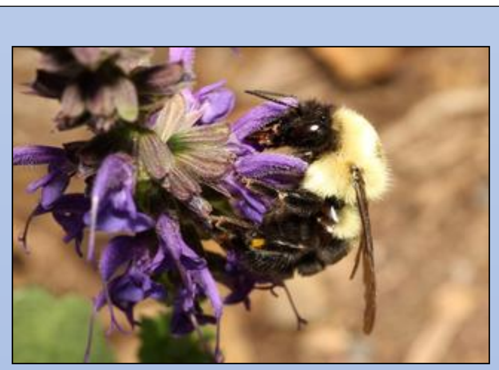

Fig. 11: Bombus bimaculatus

Fig. 12: Nomada articulata

Fig. 13: Hylaeus mesillae

Fig. 14: Bombus griseocollis

Fig. 15: Andrena wilkella

References

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